

What is claimed is:

- 1 1. A method for preventing damage to an anti-
2 reflective structure during removing an overlying
3 photoresist layer, comprising the steps of:
4 forming a nitrogen-free silicon oxide layer having a
5 refractive index of 1.4~1.7 overlying the anti-
6 reflective structure to serve as a protective
7 layer;
8 forming a patterned photoresist layer overlying the
9 nitrogen-free silicon oxide layer; and
10 removing the patterned first photoresist layer.
- 1 2. The method as claimed in claim 1, wherein the
2 anti-reflective layer contains no nitrogen.
- 1 3. The method as claimed in claim 1, wherein the
2 anti-reflective structure consists at least one silicon
3 oxynitride layer.
- 1 4. The method as claimed in claim 1, wherein the
2 nitrogen-free silicon oxide layer is formed by plasma
3 enhanced chemical vapor deposition.
- 1 5. The method as claimed in claim 4, wherein the
2 nitrogen-free silicon oxide layer is formed from SiH_4 and
3 CO_2 .
- 1 6. The method as claimed in claim 1, wherein the
2 nitrogen-free silicon oxide layer has a thickness of about
3 10~500 Å.

- 1 1. A method for preventing damage to an anti-
2 reflective structure during removing an overlying
3 photoresist layer, comprising the steps of:
4 forming a nitrogen-free silicon oxide layer having a
5 refractive index of 1.4~1.7 overlying the anti-
6 reflective structure to serve as a protective
7 layer;
8 forming a patterned photoresist layer overlying the
9 nitrogen-free silicon oxide layer; and
10 removing the patterned first photoresist layer.
- 1 2. The method as claimed in claim 1, wherein the
2 anti-reflective layer contains no nitrogen.
- 1 3. The method as claimed in claim 1, wherein the
2 anti-reflective structure consists at least one silicon
3 oxynitride layer.
- 1 4. The method as claimed in claim 1, wherein the
2 nitrogen-free silicon oxide layer is formed by plasma
3 enhanced chemical vapor deposition.
- 1 5. The method as claimed in claim 4, wherein the
2 nitrogen-free silicon oxide layer is formed from SiH_4 and
3 CO_2 .
- 1 6. The method as claimed in claim 1, wherein the
2 nitrogen-free silicon oxide layer has a thickness of about
3 10~500 Å.

1 7. The method as claimed in claim 1, wherein the
2 nitrogen-free silicon oxide layer has an extinction
3 coefficient of about 0~0.5.

1 8. The method as claimed in claim 7, wherein the
2 nitrogen-free silicon oxide layer is a silicon dioxide
3 layer.

1 9. The method as claimed in claim 7, wherein the
2 nitrogen-free silicon oxide layer is a silicon oxycarbide
3 layer.

1 10. A method for preventing damage to an anti-
2 reflective structure during removing an overlying
3 photoresist layer, comprising the steps of:
4 in-situ formation of a nitrogen-free silicon oxide
5 layer having a refractive index of 1.4~1.7 and an
6 extinction coefficient of 0~0.5 overlying a
7 nitrogen-free dielectric anti-reflective
8 structure to serve as a protective layer;
9 forming a patterned photoresist layer overlying the
10 nitrogen-free silicon oxide layer; and
11 removing the first patterned photoresist layer.

1 11. The method as claimed in claim 10, wherein the
2 nitrogen-free silicon oxide layer is in-situ formed by
3 plasma enhanced chemical vapor deposition.

1 12. The method as claimed in claim 11, wherein the
2 nitrogen-free silicon oxide layer is formed from SiH_4 and
3 CO_2 .

1 13. The method as claimed in claim 10, wherein the
2 nitrogen-free silicon oxide layer has a thickness of about
3 10~500 Å.

1 14. The method as claimed in claim 10, wherein the
2 nitrogen-free silicon oxide layer is a silicon dioxide
3 layer.

1 15. The method as claimed in claim 10, wherein the
2 nitrogen-free silicon oxide layer is a silicon oxycarbide
3 layer.

1 16. A semiconductor device for preventing damage to an
2 anti-reflective structure during removing an overlying
3 photoresist layer, comprising:

4 a nitrogen-free dielectric anti-reflective structure
5 disposed overlying a substrate; and
6 a nitrogen-free silicon oxide layer having a refractive
7 index of 1.4~1.7 disposed overlying the nitrogen-
8 free anti-reflective layer to serve as a
9 protective layer.

1 17. The semiconductor device as claimed in claim 16,
2 wherein the nitrogen-free silicon oxide layer has an
3 extinction coefficient of about 0~0.5.

1 18. The semiconductor device as claimed in claim 17,
2 wherein the nitrogen-free silicon oxide layer is a silicon
3 dioxide layer.

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1 19. The semiconductor device as claimed in claim 17,
2 wherein the nitrogen-free silicon oxide layer is a silicon
3 oxycarbide layer.

1 20. The semiconductor device as claimed in claim 16,
2 wherein the nitrogen-free silicon oxide layer has a
3 thickness of about 10~500 Å.